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DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ALGEBRA.

335. Proposed by PROFESSOR L. E. DICKSON, Ph. D., The University of Chicago.

A person has \$1800 in notes payable \$18 monthly, bearing 10% interest. Find their present value if the interest is payable at the maturity of each note; also present value if interest is payable annually. [An actual business transaction.]

Solution by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

From the reading of the problem, it is supposed that the \$1800 is the actual amount to be paid, including interest.

I. Let x=present value.

$$\text{Then } x=\frac{18}{1.00\tfrac{5}{6}}+\frac{18}{(1.00\tfrac{5}{6})^2}+\frac{18}{(1.00\tfrac{5}{6})^3}+\ldots+\frac{18}{(1.00\tfrac{5}{6})^{100}}$$

$$=\frac{18}{(1.00\tfrac{5}{6})^{100}}[1+1.00\tfrac{5}{6}+(1.00\tfrac{5}{6})^2+\ldots(1.00\tfrac{5}{6})^{99}]$$

$$=\frac{18}{(1.00\tfrac{5}{6})^{100}}\left(\frac{(1.00\tfrac{5}{6})^{100}-1}{.00\tfrac{5}{6}}\right)=2160\left(1-\frac{1}{(1.00\tfrac{5}{6})^{100}}\right)$$

$$=2160(1-.436114)=1217.994, \text{ the number of dollars.}$$

II. In such transactions the interest for each year is calculated as though no payments were made. Hence,

$$x(1.10)^8(1.03\tfrac{1}{3})-216[(1.10)^7+(1.10)^6+\ldots+1](1.03\tfrac{1}{3})-72=0.$$

$$x(1.10)^8(1.03\tfrac{1}{3})=2160[(1.10)^8-1](1.03\tfrac{1}{3})+72.$$

$$x=2160\left(1-\frac{1}{(1.10)^8}\right)+\frac{72}{(1.10)^8(1.03\tfrac{1}{3})}.$$

x=\$1184.846.

336. Proposed by V. M. SPUNAR, M. and E. E., East Pittsburg, Pa.

Evaluate the determinant

$$\Delta=\begin{vmatrix} a_1^2, & a_2^2, & a_3^2, & \ldots & a_n^2 \\ a_2^2, & a_3^2, & a_4^2, & \ldots & a_{n+1}^2 \\ a_3^2, & a_4^2, & a_5^2, & \ldots & a_{n+2}^2 \\ \cdot & \cdot & \cdot & \cdot\;\cdot\;\cdot & \cdot \\ a_n^2, & a_{n+1}^2, & a_{n+2}^2, & \ldots & a_{2n-1}^2 \end{vmatrix}$$